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AUTHOR Ciesla, Jerome L.; Okey, James R.
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ABSTRACT

The development and evaluation procedures used in the production of a self-instructional module entitled TEACHING FOR MASTERY are discussed. Particular attention is given to the integration of the developmental activities and the day-to-day preparation of science teachers in typical science methods courses. The evolution of the product from its initial idea through its development, several revisions, and evaluations is traced. Practical suggestions for evaluating teacher training materials in the context of science teacher preparation programs are also given. (Author)

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Developing and Evaluating Materials for Training Teachers to Use Bloom's Mastery Teaching Strategy[1]

Jerome L. Ciesla
Florida State University

James R. Okey
Indiana University

In an earlier paper we identified three important questions that developers or evaluators of teacher training materials need to ask:

1. *Do teachers attain the skills that the materials were designed to teach?*
2. *Do teachers use skills from the training materials in their classrooms?*
3. *Does the use of these skills by teachers have any effect on student learning?*

Since the focus of that paper[2] was entirely on evaluation designs to aid in answering the third question listed above, we shall take this opportunity to examine the first two questions. Our vehicle for discussing these questions in the context of a real-world situation is a self-instructional teacher training

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1. Paper presented in the symposium titled Developing and Evaluating Materials for Training Science Teachers at the annual meeting of the National Association for Research in Science Teaching, Chicago, April 1974.

2. Okey, J. R., & Ciesla, J. L., Designs for the evaluation of teacher training materials. AV Communication Review, 1973, 21, 299-310.

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module we developed and evaluated. It is titled Teaching for Mastery (TFM) and was designed to train preservice and inservice teachers to implement Bloom's mastery learning strategy.

The overall goal of the training program is to teach teachers to implement a five-step plan for increasing the achievement of their students. The major skills required to do this are learning to prepare and administer diagnostic tests over course objectives at frequent intervals, and then to direct students to remedial work as needed.

The package we eventually developed and tested consisted of a bound manual somewhat over 100 pages in length containing instruction, many pencil and paper exercises, and self tests for each of the six sections into which the program is divided. A total of 22 outcomes are stated in the manual that range from sequencing objectives, to constructing diagnostic tests, to selecting alternative instruction for unsuccessful students. The entire module required about 5 hours for a teacher to complete.

Do Teachers Attain the Skills . . . .?

This primary concern of a developer or evaluator of teacher training materials can result in an endless delay in the development or evaluation effort if two prior questions have not been asked and answered. These, of course, are: *What exactly are the skills for which training is to be given?* And *What measures will be used to determine whether the skills have been mastered?*

Using our TFM module development as an example, one of our first tasks was to clearly define the individual skills (performance objectives) that we felt teachers must acquire in order to reach the overall goal of the training program. Once these objectives were identified, we proceeded to develop an evaluation measure for each of the 22 objectives in the program.

Once these preliminary tasks are completed, the developer then has a more clearly defined picture of what instruction will need to be developed in order to get users to demonstrate attainment of the specified objectives.

The next step in the process should be somewhat obvious. If, as a developer of a certain instructional product, you have listed all the objectives you are trying to reach and you have the ways of knowing when you have reached them, the problem then becomes HOW you reach them. In other words, what kind and how much instruction must be provided to users of the product to get them to the point of being successful on the various measures of skill attainment?

In developing self-instructional materials, such as our TFM module, care must be taken to present the instruction in a manner that minimizes the chance of losing the learner as he or she is trying to work through the instructional package. Two important aspects of the instruction should be considered in this regard. First, the effects of different instructional sequences must be

considered. Unless the instructional objectives in the product are completely independent, the developer must attempt to sequence the instructional units in a manner that optimally facilitates learning among users who may use the materials in a non-tutorial setting.

A second consideration is the actual design or format of the self-instructional materials. The question asked here is: *What is a good pattern to have users follow to facilitate learning in a self-instructional setting?* In our TFM module, depending upon the difficulty of the objective, we used one of the two following patterns of instruction:

(A) [Instruction (Obj. n) → Practice → Feedback] → [Instruction (Obj. n + 1) → etc.]

(B) [Instruction (Obj. n) → Practice → Feedback → More Practice → More Feedback] → [Instruction (Obj. n + 1) → etc.]

Following instruction and appropriate practice and feedback for three to five objectives, a test measuring learner's attainment of those objectives was presented. Again, due to the self-instructional mode of the module, the test was a self-test, and feedback in the form of model answers had to be provided to the user for each self-test item.

One of the ways we judged the success of the instruction for each objective was to examine the respective self-test item success rates of users of the materials. We arbitrarily set as our goal to have mastery of each objective in the module demonstrated by at least 80% of the subjects (i.e., preservice and inservice teachers in our science methods classes) who tried the materials

during their various stages of development or revision. Needless to say, it required several cycles of material development -- trial -- revision to reach our goal.

Do Teachers Use These Skills in Their Classrooms?

Even though the answer to the first of the three questions we posed at the beginning of this paper may be yes, little peace of mind is afforded to the instructional product developer. The second question proceeds to haunt him or her just as it would any teacher educator who is concerned with the outcomes of the training given to prospective or inservice teachers.

There are several approaches one could take in finding an answer to this question, and each could result in differing degree of uncertainty associated with the findings. For example, if you used some teacher training materials with a group of preservice teachers you could merely ask them if they think they will use the skills they acquired when they actually teach a class of their own. If they all respond affirmatively, but you still feel the need for some additional proof, you could ask them to contact you in a year or two when they have become classroom teachers and let you know if they are using the training they received. If, however, you have neither the patience nor the naivete required to follow the previous suggestion you will probably try another approach.

A quicker way to obtain some feedback about the classroom utilization of the training teachers receive is to ask inservice

teachers who are receiving the training to report on their attempts to practice their newly acquired skills in the classroom.

And finally, if you are still plagued by insecurity as a result of your own uncertainty about the utility of a teacher training package, or by demands for some empirical support, you will need to conduct some type of classroom observation study of teachers who used the training package.

To obtain some empirical evidence regarding whether or not teachers who used our TFM module could put into practice what our training materials preached, we trained observers to record relevant events that occurred in elementary school classes taught by several randomly selected teachers who had studied our module as part of a science methods course. Each teacher taught two class sections of students and was instructed to use the skills she had acquired through the TFM module in teaching one section and not to use these newly acquired skills in teaching the other section.

The observers recorded the differences they observed between each teacher's pair of classes daily, using a form we designed for this purpose (Appendix A). When the two-week observation period ended and the data from the observation forms were gathered and analyzed, we found that the observers reported very sizeable differences in observable teacher behaviors when teachers taught their one section as compared to teaching the other. These differences were directly related to the training they were given in the TFM module and which they used in teaching one

class but not the other.*

The results of our study had two important effects. First, it increased our own faith in the applicability of our training materials in actual classroom teaching situations. Second, it satisfied a necessary prerequisite to conducting studies of the effects of the training teachers received on their students. In other words, it would be a wasted effort to conduct a study of the effects on students of different teaching strategies, unless one could first show proof that different teaching strategies were, in fact, being exhibited by the teachers in the study.

It is our belief that the question addressed in this second half of this paper needs to receive much more attention than it has in the past. Questions about what methods to use in developing training materials for teachers or in measuring the effects of the training on students seem to have overshadowed the equally important problem of finding methods to use in studying the degree to which the training teachers receive is put into practice in the classroom.

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*For a more complete description of this procedure and analysis see Ciesla, J. L., & Okey, J. R., The effects of training preservice teachers to use Bloom's mastery teaching strategy: A process-product study. Paper presented at the AERA Annual Meeting, Chicago, 1974.

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APPENDIX A

Observer: _____

Date: _____

Teacher: _____

OBSERVER'S DIRECTIONS:

Complete one of these observation forms each day during the last five minutes of Period B; then give the form to Mr. Ciesla.
On the left side of this form are descriptions of events you may have observed during the teacher's first teaching period, (Period A), or during her second teaching period,(Period B). For each description you are to circle one of the six designations on the right side of the form to indicate what you observed.

Circle A------If the description applies only to Period A.
Circle Ab------If the description applies mainly to Period A and to a lesser extent to Period B.
Circle ab------If the description applies equally to Periods A & B.
Circle aB------If the description applies mainly to Period B and to a lesser extent to Period A.
Circle B ------If the description applies only to Period B.
Circle N ------If the description applies to neither Period A nor Period B.

1.	After pupils completed instruction covering one or more objectives, they were tested for mastery of these objectives.	1. A Ab ab aB B N
2.	Pupils corrected their own tests.	2. A Ab ab aB B N
3.	Pupils' performances on tests were judged acceptable when they achieved the level of competency specified in the performance objectives.	3. A Ab ab aB B N
4.	When pupils failed to demonstrate mastery of an objective they were directed to repeat the same instruction they had received.	4. A Ab ab aB B N
5.	When pupils failed to demonstrate mastery of an objective they were given some alternate form of instruction.	5. A Ab ab aB B N
6.	The teacher used a variety of instructional methods in teaching.	6. A Ab ab aB B N
7.	The teacher kept a record of each pupil's daily progress.	7. A Ab ab aB B N
8.	The teacher conducted a lesson aimed at one or more of the objectives on the attached pages.	8. A Ab ab aB B N
9.	Pupils were given ample opportunity to learn.	9. A Ab ab aB B N
10.	Pupils clearly understood what the teacher expected them to do.	10. A Ab ab aB B N
11.	The teacher was enthusiastic in her teaching.	11. A Ab ab aB B N
12.	The pupils were enthusiastic learners.	12. A Ab ab aB B N
13.	Discipline was a problem for the teacher.	13. A Ab ab aB B N
14.	The teacher observed the guidelines as set forth on the attached page.	14. A Ab ab aB B N